Announcements

- 1st EXAM *TOMORROW!*
- NO Homework for tomorrow…

  CQ7: a) Q -> Q b) E -> $E/2$ c) ΔV_c -> ΔV_c

  28.20: a) 1.0 x 10^3 V b) 7.0 x 10^6 m/s

  28.22: -5.8 x 10^3 V

  28.34: x = 3 cm

- Office hours…

  MW 10-11 am

  TR 9-10 am

  F 12-1 pm

- Tutorial Learning Center (TLC) hours:

  MTWR 8-6 pm

  F 8-11 am, 2-5 pm

  Su 1-5 pm

Outline…

CH 25 – Electric Charges & Forces

- Developing a Charge Model
- Charge
- Insulators & Conductors
- Coulomb's Law
- The Field Model

CH 26 – The Electric Field

- Electric Field Models
- *E*-Field of Multiple Pt. Charges
- *E*-Field of a Continuous Charge Distribution
- *E*-Fields of Rings, Disks, Planes, & Spheres
- The Parallel-Plate Capacitor
- Motion of a Charged Particle in an *E*-Field

CH 27 – Gauss's Law

- Conductors in Electrostatic Equilibrium

CH 28 – The Electric Potential

- Electric Potential Energy
- The Potential Energy of Point Charges
- The Electric Potential
- The Electric Potential inside a Parallel-Plate Capacitor
- The Electric Potential of a Point Charge
- The Electric Potential of Many Charges

Chapter 25

Coulomb's Law

$$F = \frac{kqq}{r^2}$$

E-Field Model

$$\vec{E} \equiv \frac{\vec{F}_{on\,q}}{q} \qquad F = qE$$

$$E = \frac{kQ}{r^2}$$

$$\lambda = \frac{Q}{L}$$

$$\eta = \frac{Q}{A}$$

Kinematics

$$v_1 = v_0 + a\Delta t$$

$$\Delta x = v_1\Delta t + \tfrac{1}{2}a\Delta t^2$$

$$v_1^2 = v_0^2 + 2a\Delta x$$

Chapter 26

$$\vec{E}_{Dip\,Axis} = \frac{2k\vec{p}}{r^3} \qquad \vec{p} = qs$$

$$\vec{E}_{Dip\,Plane} = \frac{-k\vec{p}}{r^3} \qquad \vec{p} = qs$$

$$\vec{E}_{rod} = \frac{2k\lambda}{r\sqrt{1+4r^2/L^2}}$$

$$\vec{E}_{line} = \frac{2k\lambda}{r}$$

$$\vec{E}_{ring} = \frac{kzQ}{(z^2+R^2)^{3/2}}$$

$$\vec{E}_{Disk} = \frac{\eta}{2\epsilon_0}\left[1 - \frac{z}{\sqrt{z^2+R^2}}\right]$$

$$\vec{E}_{plane} = \frac{\eta}{2\epsilon_0}$$

$$\vec{E}_{cap} = \frac{\eta}{\epsilon_0}$$

Chapter 27

$$E_{surface} = \frac{\eta}{\epsilon_0}$$

Chapter 28

$$W = \vec{F}\cdot\Delta\vec{r} \qquad W = \int_i^f \vec{F}\cdot d\vec{s}$$

$$W = -\Delta U$$

$$U_{Elec\,cap} = QE\Delta s$$

$$U_{Elec} = \frac{kq_1q_2}{r}$$

$$V = \frac{U}{q} \qquad U = qV$$

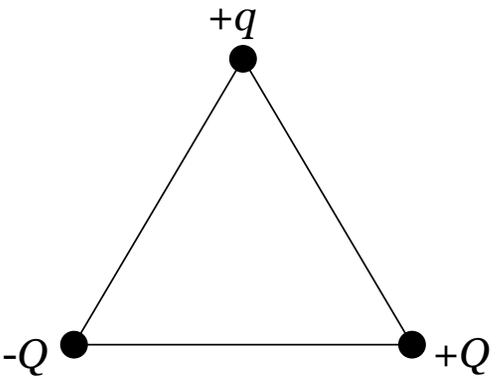
$$V_{cap} = Es \qquad V_{Ring} = \frac{kQ}{\sqrt{r^2+z^2}}$$

$$V_{Point\,Charge} = \frac{kQ}{r}$$

$$V_{Disk} = \frac{2kQ}{R^2}\left[\sqrt{z^2+R^2} - z\right]$$

Q1

Charges $+Q$, $-Q$, and q are placed at the vertices of an equilateral triangle as shown. The total force exerted on charge q is:

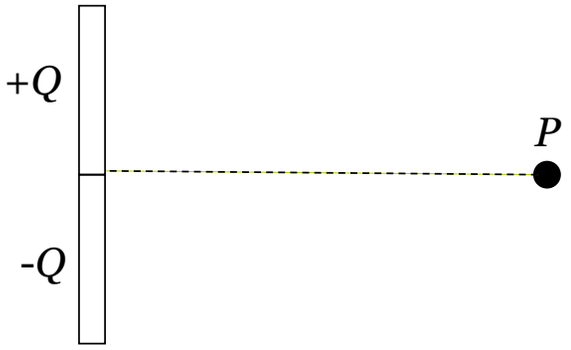


1. toward charge $+Q$.
2. toward charge $-Q$.
3. away from charge $+Q$.
4. at right angles to the line joining $+Q$ and $-Q$.
5. parallel to the line joining $+Q$ and $-Q$.

Q2

Positive charge $+Q$ is uniformly distributed on the upper half of a rod and a negative charge $-Q$ is uniformly distributed on the lower half.

What is the direction of the electric field at point P, on the perpendicular bisector of the rod?

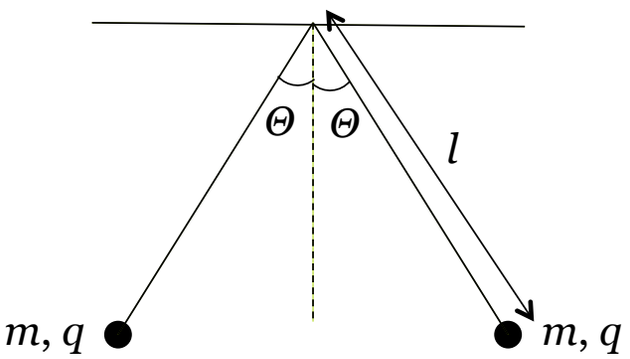


1. Up.
2. Down.
3. Left
4. Right.
5. Up and to the left.

i.e. 1

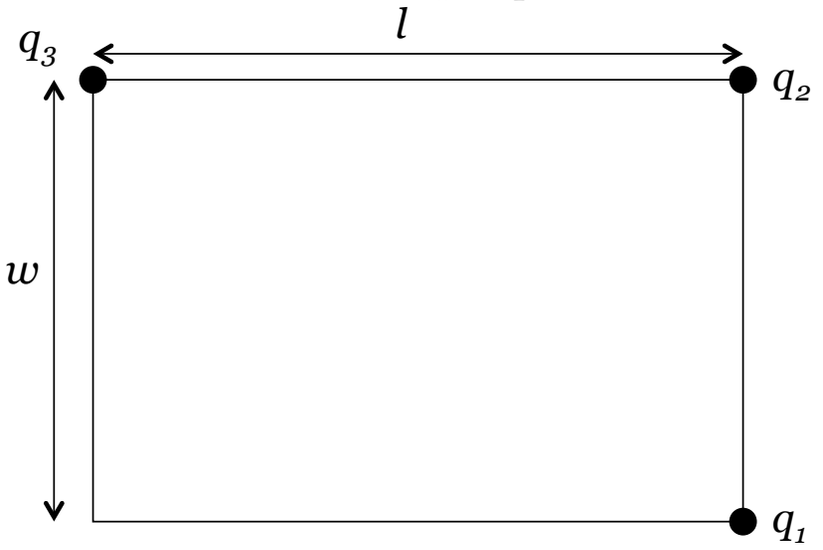
Two identical, charged spherical masses of m = 1.00 kg are each attached to a light string of length l = 1.00 m as shown in the figure below. The string makes an angle of 30° with the vertical.

What is the charge on each mass?



i.e. 2

What is the electric field at the location of q_1, due to q_2 and q_3?
What is the force on charge q_1?



The rectangle has dimensions given by l = 4.0 m and w = 3.0 m. The charges are q_1 = -10μC, q_2 = 100μC, and q_3 = 32μC.